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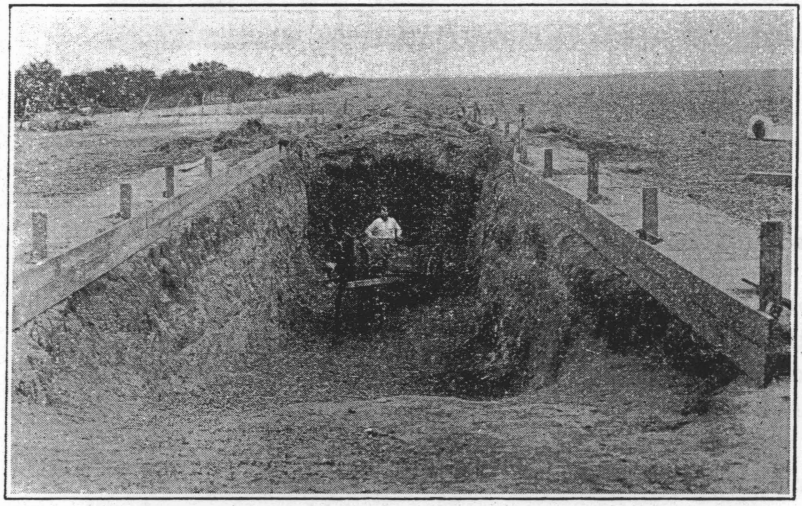
Trench Silos



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Filling the silo—Wilson county.

Trench Silos

M. R. Bentley, Extension Agricultural Engineer

SILAGE SHOULD BE CONSIDERED a substitute for green pasture. It has about the same value in the ration of a dairy cow or beef animal as does green pasture, but no greater value unless there is some grain on the feed stuff made into silage.

A silo makes it possible to have green feed when it is too dry or too cold to have a green pasture, or too wet to use the pasture. A silo should also be considered a container in which to store a surplus of feed to use when the drouthy year comes.

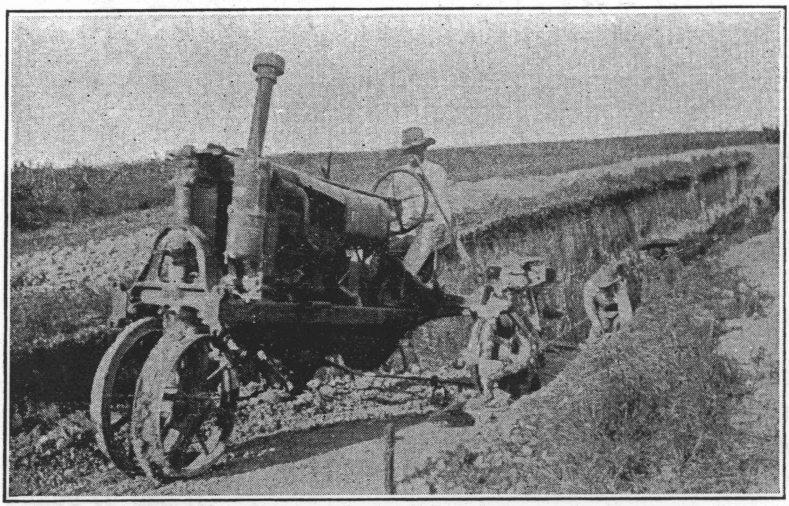
A trench furnishes the cheapest form of a silo from the standpoint of cash expenditure. Other advantages of a trench silo are: they may be constructed in a short time; it is convenient to place and pack the silage; they are less expensive to fill than above-ground silos; they are wind proof, fire proof, and frost proof; it is easy to remove the silage; and it is easy to apply water to the silage.

Some of the disadvantages of trench silos are: more silage may be wasted from spoilage; it is more expensive to cover the silage; the walls must be smoothed each year unless lined; they cannot be used if the water table is very high; laborers are exposed to the weather in removing the silage; they are unsightly in the farmstead; and trouble may be encountered from rain water in the empty portion of the trench unless drainage is provided or a roof is built over the trench.

The advantages outweigh the disadvantages when one wishes to construct a cheap silo quickly and will take the necessary precautions in filling and covering.

How To Construct

To dig a trench silo economically a fresno and plow should be used. The plow is used to loosen the dirt and the fresno to remove it. Picks, spades, and shovels must be used to cut the walls smooth. In some silos the walls may be given the final smoothing by sprinkling them and cutting them down with a hoe.

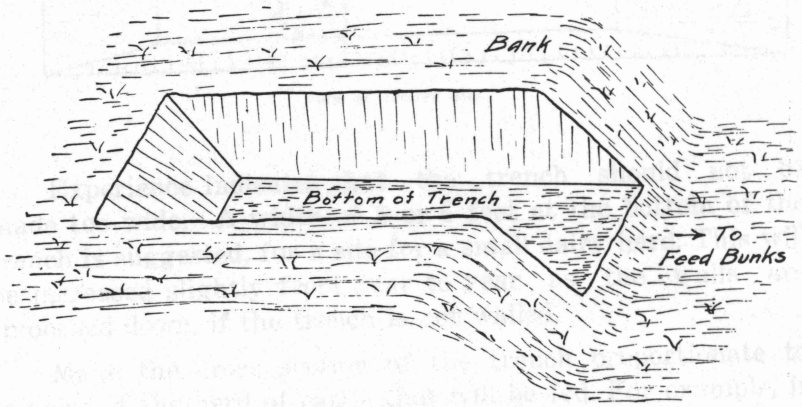


Using a tractor to dig a trench silo—DeWitt County.

Terracers have been found very useful in cutting down and to some extent smoothing the walls. They are also useful in moving the dirt away from the walls so that it is easily picked up in a fresno.

The ends of the trench should be sloped so that a team may be driven down them. As the work proceeds, one end of the trench may be made as steep as it is praticable to drive a team down it, while the other end is not made so steep. The dirt is pulled out the end that is not steep. This end should be placed so that it will be most convenient to the barn or feed troughs, so that the silage may be taken out at the end that is not steep.

If a low bluff is convenient, the end of the trench where the dirt is drawn out may be made at the brow of the bluff. In this way much of the dirt may be removed without pulling it up a grade. Arrangements should be made to remove the silage without pulling it up a grade, if the trench is on a hillside. Another advantage of having the trench run back into a hillside is the ease with which any rainfall that comes while

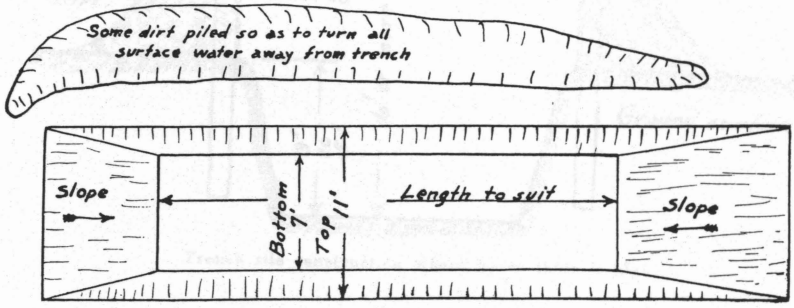


Trench silo construction in a bluff.

the silage is being used may be drained out. Where this natural drainage of the trench cannot be obtained, farmers have in some instances found it necessary to pump the water out of the empty end of the trench so they could get at the silage to use it.

Size of the Trench Silo

Trenches are usually dug from 7 to 10 feet deep. In most soils the sides should be sloped so that the top of the trench will be about 4 feet wider than the bottom, giving a wall slope of about one foot to each four feet of depth. Probably the best plan is to make the walls as near vertical as they will stand when the trench is first dug. After the trench has been filled with silage and emptied, then smooth down the walls if they have caved, giving them whatever slope is necessary to reduce caving.



Plan of trench silo.

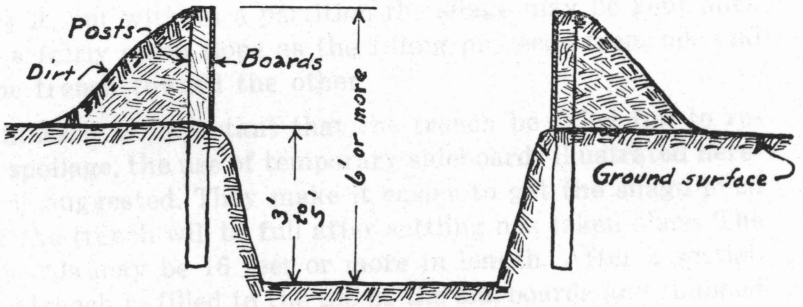
Experience indicates that the trench should not be made too wide. A width of 5 or 6 feet at the bottom of the trench is suggested, for a silo for a small dairy herd. This will be increased slightly from year to year as the walls are smoothed down, if the trench is not walled.

Make the cross section of the trench proportionate to the size of the herd of cattle that will be fed. For example, if only ten head of cattle will be fed, a suggested cross section would be a top width of 7 feet, a bottom width of 5 feet, and a depth of 6 or 7 feet.

The length may be whatever is necessary to get the required capacity. In figuring the capacity of the trench, experience shows that a cubic foot of silage weighs about 25 pounds after settling.

Construction Where Water Table Is High

If the water table stands within 4 or 5 feet of the ground surface, the trench may be dug down nearly to the water table and the walls built up around the trench with the dirt taken from it. Some permanent sideboards may be constructed against which the dirt is banked. The total depth of the trench should be as much as 6 feet. **Warning:** Any ordinary concrete, brick, or rock walls built on top of the dirt banks of a trench silo are liable to fall in the trench. It is suggested that such



Trench silo construction where water table is high.

walls be made of lumber nailed to posts set along the trench walls, or logs laid lengthwise with the inside of the log wall smoothed with mud. While a masonry wall is not impracticable, it should be carefully designed to prevent its failure.

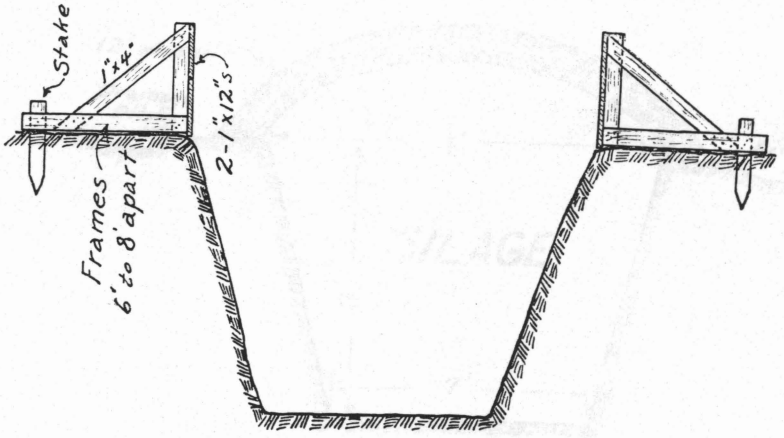
Filling The Trench

The silage is sometimes cut up with an ensilage cutter or feed cutter and is sometimes put in the silo without cutting. The advantage of putting feed in the silo uncut, is the saving of the cost of cutting. It takes a little more labor to get uncut silage out of the silo. There is little difference in the amount of spoilage with cut and uncut silage. If the feed is not cut up, the bands should be cut so that the stalks will pack well. It is best to lay the stalks lengthwise of the trench, as they will pack better than if laid crossways.

The silage may be packed as it is put in by driving horses or cattle about over it, running a tractor or auto over it, or some other method. It should have some placing or scattering by hand, especially at the walls.

Care should be taken to avoid getting the full length of the trench or a long section of it partially filled and then run short of feed to completely fill the trench. It is safer to start filling at one end and fill a section completely before starting on another section. A temporary partition across the trench, made of old boards or sheet iron, is sometimes used. This cannot be used if one wishes to drive through the trench while filling it, but without a partition the silage may be kept piled with a fairly steep slope as the filling proceeds from one end of the trench toward the other.

Since it is important that the trench be filled full to reduce spoilage, the use of temporary sideboards illustrated herewith is suggested. They make it easier to get the silage piled up so the trench will be full after settling has taken place. The sideboards may be 16 feet or more in length. After a section of the trench is filled to the top of the sideboards and rounded up, the sideboards are moved along the trench and another section filled. The filled portion of the trench should have the covering put on it the same day it is filled.



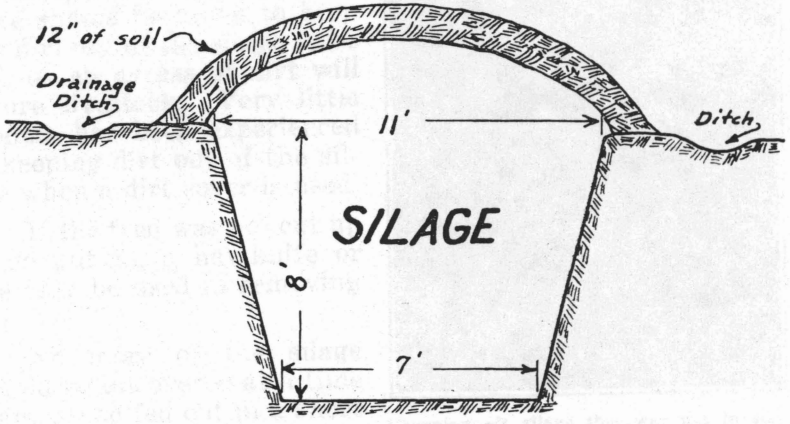
Temporary side boards for use while silo is being filled.

An abundance of water should be used in filling a trench silo. Plenty of water should be put on the silage next to the walls if the dirt is dry. Each layer of silage should be wetted down. More water must be used if the feed is dry or partially dry, than if it is green and juicy. It is well to put as much as a barrel of water on each ton of silage, and if the feed is very dry, four or five times as much may be required.

Covering the Silage

The most common method of covering the silage is to put about 12 inches of dirt over it. There are no serious objections to the use of dirt as a cover if it can be put on with a fresno. Unless the dirt is quite moist, it should be wetted as soon as it is put on, and should be kept wet for several days. The heat from the silage may dry out the dirt and unless it is kept wet, it is likely to crack and permit the spoilage of some of the silage. Sandy or loam soil is better as a covering than clay that will crack. The greatest losses from spoilage generally occur at the walls near the ground surface. This loss may be largely prevented by using plenty of covering, carefully packed along the sides of the trench.

If any sort of vegetation is placed between the silage and a dirt cover it should be green or if not, it should be thoroughly wetted. Such material as dry straw or dry stalks placed next to the silage will likely cause more harm than good.



Cross section of trench silo after silage covering has been put on.

If plenty of waste forage or green weeds are available, the covering may be made of such material. If no other material can be conveniently used, the covering may be made of some of the unchopped feed with the grain removed. Excellent results have been obtained by packing a layer of grain sorghum stalks that have had the heads removed to a depth of about two feet over the silage, using no dirt at all.

When there is any question about the kind of a cover to use, simply put on a generous amount of dirt. If the top of the covering settles below the surrounding ground level, pile on more dirt.

Keep the Cover Airtight

Small levees and ditches should be constructed, if necessary, around the trench silo after it is filled so that water from rainfall cannot flow into the trench. There is too great a surface area, proportionately, to a trench silo for it to be economical to permit rainfall or surface runoff water to go down through the silage cover opening up air holes to spoil the silage. Watch for cracks in a dirt covering and keep them filled up.

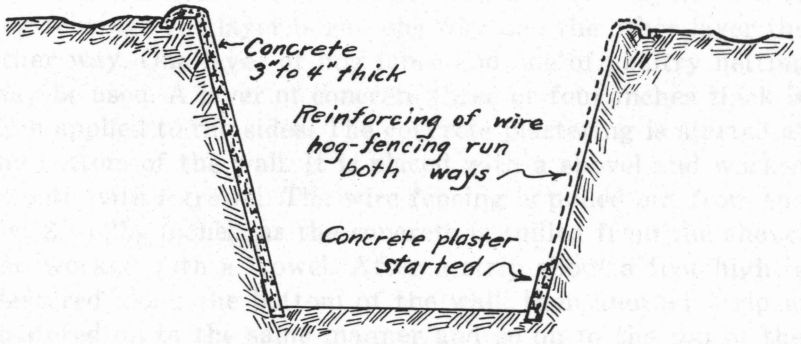
Removing Silage

To feed out the silage, the trench is opened at one end by scraping off a strip of the covering down to good silage. Care should be taken to keep the dirt out of the silage to be fed, as an excess of dirt will injure livestock. Very little trouble has been experienced in keeping dirt out of the silage when a dirt cover is used.

If the feed was not cut up when put in, a hay-knife or axe may be used in removing it.

No more of the silage should be uncovered at a time than can be fed out in a short time.

Chopping off silage that was put in silo uncut—Mitchell county.



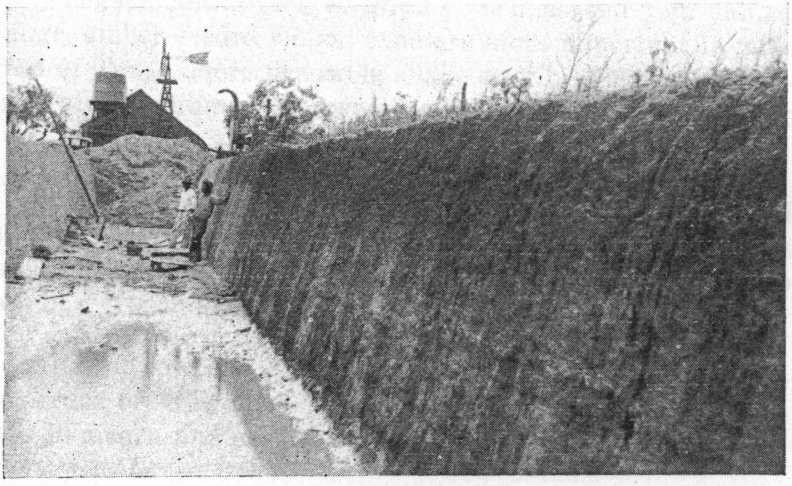
Section of trench silo to show concrete wall made without forms.

Walling Sides of Trench

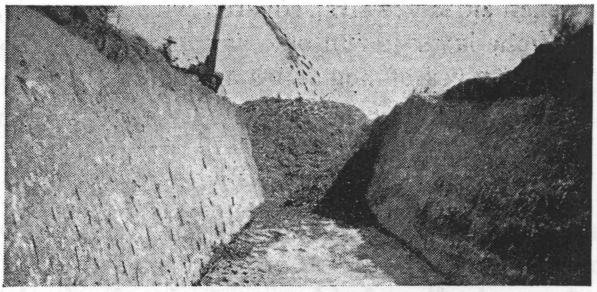
If a trench silo is to be used year after year, it may pay to wall up the sides of the trench, if they tend to cave. These side walls will serve two purposes; with smooth walls, the loss from spoilage at the walls will be reduced and then the caving of the dirt will be prevented. There will be some caving of the sides of the trench in most soils, as soon as the silage is removed from the trench. In parts of Texas caving is not serious, and walls are not important. In other places the caving and subsequent smoothing of the sides of the trench before refilling it will make the trench too wide in two or three years. Where caving is very considerable, it is necessary to abandon a trench after two or three years, and dig a new one or else put in walls before the trench gets too wide.

An economical concrete wall is suggested herewith. To avoid the expense of providing forms for concrete, the sides may be given a little slope and the concrete plastered on them with a trowel. A slope of about one foot to each four feet of height is suggested. It would not be economical to make the concrete walls vertical, since too much concrete and reinforcing would be required to make a wall strong enough to stand vertically.

The trench sides are first covered with two layers of wire hog-fencing; one layer is run one way and the other layer the other way. One layer of hog fence and one of poultry netting may be used. A layer of concrete three or four inches thick is then applied to the sides. The concrete plastering is started at the bottom of the wall. It is placed with a shovel and worked smooth with a trowel. The wire fencing is pulled out from the dirt 2 to 2½ inches, as the concrete is spilled from the shovel and worked with a trowel. After a strip about a foot high is plastered along the bottom of the wall, then another strip is plastered on in the same manner and so on to the top of the wall. It is advisable to make a concrete roll at the top of the wall extending back about a foot to strengthen the concrete wall and also to prevent water from running in behind the wall. A concrete mixture of one part Portland cement, two parts sand, and four parts gravel should be used. The concrete should be as stiff as can be worked easily. The pebbles in the gravel should be of various sizes but none of them more than one and one-half inch in diameter. The usual method of curing the concrete, by keeping it damp for two weeks, should be used.



Right hand side being covered with hog wire, chicken wire, and concrete,—plastered on.—Wilson county.



Silage As A Feed*

TONNAGE OR YIELD is the most important factor to consider in growing any kind of crop for silage. Grain content, quality and maturity are other important factors.

While corn is generally considered the most desirable crop for silage, the grain sorghums such as kafir, milo, feterita, hegari, and sweet sorghums such as red top, sumac, orange, amber seeded ribbon cane are more important in most areas of Texas. More desirable silage may be secured by mixing grain sorghums and sweet sorghums. Plant in alternate rows.

Small grain crops, such as wheat, oats, and barley; and hay crops such as sudan and Johnson grass may be used as silage but are more expensive in preparation and harder to pack in a trench silo.

Alfalfa, cowpeas, soy beans, peanuts and other leguminous crops provide good silage when mixed with carbonaceous crops like corn and sorghums.

*Prepared by C. N. Shepardson, head of A. & M. Dairy Department; A. L. Smith, extension animal husbandman; John H. Jones, Texas Agricultural Experiment Station; and E. A. Miller, extension agronomist.

In an emergency any green feed can be put into a silo, but the silage will be of low grade. Sunflowers, blood weeds, Russian thistles, cotton stalks, and similar plants make inferior silage.

Preparing Crops For Silo

Harvesting of a feed crop for silage at proper maturity insures in a large measure its value as a feed. Harvest crops for silage in the dough stage and before the leaves have fired. This is true of corn, grain sorghums, sweet sorghums and, if used, of small grains.

Legumes such as peanuts, soy beans and cow peas should be harvested for silage when pods are fully developed and before mature enough to shatter.

Enough water must be added to all silage to insure proper fermentation and to prevent spoilage. Adequate water and proper packing, especially along the outer edges, are the most important factors in preventing spoilage. While good silage can be made by using whole bundles, the use of silage cutters will insure a better quality and make silage easier to remove.

The amount of water necessary will depend on the maturity of the crop. The more mature the crop the more water is required. In all cases enough water should be used to allow a slight run off while filling.

Silage should be piled high enough to be mounded when settled. This is made easier to do by throwing up a rough board frame work two or three feet high all around the edges of the trench. The frame work can be easily torn down after silage has settled.

Silage In Rations

Dairy Cattle—Because it is a succulent, bulky, palatable and cheap feed, and is the best known substitute for green pasture, silage is particularly desirable in a ration for dairy cattle. It is fed at the rate of three pounds silage per day for each 100 pounds live weight of the animal. In addition a dairy

cow should have all the hay she will clean up, together with grain in proportion to her milk production. Dry cows, bulls and young heifers can be maintained at low cost with silage as the major part of the roughage in a ration.

Beef Cattle—In fattening rations silage has proven to be a very satisfactory feed to use as a roughage. This is especially so in starting calves on feed on account of large consumption and ease of feeding. In all cases there should be a small amount of dry hay supplied daily. It is fed in large amounts at the start of the feeding period and supplemented by grain and cake and hay as the feeding period progresses. Feed from two to three times as much silage as dry hay. For fattening or "warming up" old cows or bulls silage is an economical feed when supplemented with cake.

The breeding herd can be maintained cheaper in winter by using silage as the basis of the ration. It can be fed in all kinds of weather and with less waste than hay.

Sheep—Silage is an economical feed for sheep. Four to five pounds of silage for grown sheep has been fed with good results. A small amount of hay and grain should also be fed. Lambs can be fattened satisfactorily by using silage for the bulk of the roughage in the ration, although a small amount of hay should be fed at all times.

Horses and Mules—Silage is a safe feed when fed to horses and mules if it is of good quality. Work stock should be fed as much hay as silage, particularly in warm weather. Work stock should be limited in the amount consumed and fed dry hay in an amount equal to half of the roughage silage. It is considered very desirable for maintenance of brood mares and colts. Particular care should be taken to avoid feeding moldy or frozen silage, which may cause colic.

Precaution: Moldy, decayed or frozen silage should never be fed. Sour silage too, may cause digestive troubles. Sweet sorghums (canes) should not be harvested when in an immature stage, as they will prove to be sour. Mixtures of sweet and grain sorghums will help prevent this difficulty.

Measuring Silage

A slice of silage at least two inches thick, and better four inches, should be removed every day, from a trench silo, otherwise there will be spoilage losses.

In figuring the size of a trench silo the main thing is to decide how many pounds of silage are needed per day. A dairyman with 12 cows would need 30 pounds per cow per day or a total of 360 pounds daily. A 4-inch slice of silage removed daily will require 3½ square feet of cross section per cow to furnish this. For a 12-cow herd, multiply 12 by 3½ to find that a 42-square-foot cross section would be needed. Assume a depth of 7 feet, divide 42 by 7, and the result is the average width, in this case 6 feet. Since the top width is usually made about 2 feet wider than the bottom width, the top in this example would be made 7 feet wide and the bottom 5 feet wide. To get the length, divide the number of days in the year in which silage is to be fed by 3, allowing a little extra for wastage. For example, if silage is to be fed in December, January, February and August, a total of about 120 days, divide 120 by 3. This would indicate a trench at least 40 feet long is needed. It would probably be dug 45 feet long to insure plenty.

If the herd is twice this size either remove an 8-inch slice each day, or deepen and widen the trench. A 10-foot depth, a top width of 10 feet, and a bottom width of 8 feet will work out in the case given.

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